VIRGINIA'S MARINE WATERS AND FISHERIES

A series of natural phenomena have combined off the Virginia coast to create some of the richest marine waters in the world. The bounty of these waters is readily apparent to recreational fishermen who pursue a seemingly endless variety of finfish species.

The Chesapeake Bay and its great tidal rivers join to form the largest and most productive estuarine complex in North America. They supply a vast amount of nutrients into coastal waters and provide a huge spawning and nursery area for many species of fish.

The warm waters of the Gulf Stream flow north along the East Coast until they collide with the cool, plankton-rich waters of the Labrador Current flowing south. The intermixing of these currents occurs near Cape Hatteras, North Carolina, and in adjacent waters. This puts the southern coast of Virginia in the dynamic area where the Mid-Atlantic Bight and South Atlantic Bight are joined, and brings a huge mix of finfish species into local waters. In fact, Virginia is the southernmost range of real abundance for many temperate species of fish and the northern range of abundance for many subtropical species.

The large peninsula which forms the Eastern Shore of Virginia is flanked by a chain of uninhabited and unspoiled barrier islands. These islands protect a rich complex of marshes, bays and sounds which provide a haven for a variety of marine life.

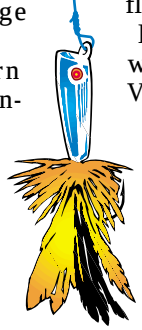
THE CHESAPEAKE BAY

The main portion of the Chesapeake Bay follows the ancient bed of the Susquehanna River. Dramatic forces during the Ice Age, which helped shape the Susquehanna Valley, and the rising ocean waters caused by the melting ice cap as the Ice Age ended, transformed the southern portion of this river valley into the vast estuarine complex that today is the Chesapeake Bay.

The Chesapeake Bay continues as the place where several of the great rivers in the eastern United States meet the ocean. The Susquehanna River has the greatest impact on the Bay contributing, on average, almost 50% of the freshwater flowing into the Bay. The Potomac and the James Rivers provide more than 15% each, leaving under 20% for the combined inflows from more than a dozen other rivers including the Rappahannock, York, Chester, Choptank and Nanticoke.

Water also flows into the Chesapeake Bay from the ocean. A relatively constant inward flow of ocean water occurs along the bottom at the mouth of the Chesapeake Bay. These ocean waters, laden with salts and minerals, are heavier and more dense than the freshwaters flowing from the rivers into the Bay and out its mouth in the upper portions of the water column. This pattern of water circulation, with heavier saltwaters flowing into the Bay along the bottom while lighter freshwaters flow out near the surface, was documented in a scientific study by the Virginia Institute of Marine Science.

The mixing of ocean and rivers waters in the Chesapeake Bay produces waters which are variably salty and fresh, often changing based upon short term weather phenomena, long term weather or climatic patterns, tides,



Many anglers believe the Gulfstream waters harbor the most magnificent game fish found anywhere in the world. For a combination of power, speed and "grayhounding" jumps, no fish in the ocean can match the magnificent blue marlin.

depth and location. However, certain patterns remain constant. Bay waters along the eastern side of the Bay are saltier than waters along the western shore. This is due in large measure to the large inflows of freshwater from the western rivers and a phenomenon called the coriolis effect – a result of the rotation of the earth.

Tides, which are caused by the rise and fall of ocean waters due primarily to the gravitational forces of the moon and the sun, cause variations in salinity. During high or rising tides salinities increase in the Bay and move further up the Bay, while the opposite occurs on low or falling tides. Since tidal movement originates at the mouth of the Bay (tides are the rise and fall of ocean waters), the times of the peak high and low tides vary by location. The "wave" of tidal flow starts at the mouth of the Bay and must physically move to its upper reaches and up its tributary rivers. This takes time and the difference between the time of the high tide at places near the mouth of the Bay and others farther up the Bay or in the tidal portion of its tributary rivers can vary by as much as 4 – 6 hours.

Forces with seemingly little connection to the Chesapeake Bay can have major impacts on salinity levels. For example, heavy rains in western Virginia, Maryland and Pennsylvania mountains may create flash floods which can send pulses of freshwater down major rivers. These pulses are called "freshets" as they reach the brackish waters of the rivers near the Chesapeake Bay, and these sudden changes in salinity can have pronounced impacts upon marine life. In fact, the torrential rains in Pennsylvania during Hurricane Agnes in 1972, creating epic floods from the Susquehanna River, had catastrophic effects on the Chesapeake Bay. In fact, Agnes may have been the "trigger" mechanism for the disappearance of vast areas of underwater sea grasses in the Bay. Unfortunately, the sea grasses have not been able to recover, probably due to the combination of pollution, excess nutrients and turbidity associated with water quality problems.

Changing salinty levels are not the only dynamic forces impacting the Bay environment. Water temperatures vary dramatically on an annual basis. The water temperatures found in the Chesapeake Bay probably have the highest average annual variance of any location on the East Coast. Winter often produces skim ice and even harder freezes on the lower Bay tributary rivers, and several times in this century portions of the main stem of the Chesapeake Bay have been covered with ice. Summertime surface water temperatures in shallow bays may approach, or exceed, 90 degrees. Sudden changes in temperature, which may occur during extended cold snaps in the fall or early winter, can cause water temperatures to drop dramatically resulting in severe stress to fish and other marine life.

Even events outside of the Bay can impact its water temperature regimen. Heavy snowfall early in the fall in the Blue Ridge mountains can result in a drastic lowering of the water temperatures in the tributary rivers running to the Bay. As these rivers feed into the Bay, the water temperature can be lowered rapidly with often severe impacts on marine life.

For these reasons, the marine life found in the Chesapeake Bay is among the hardiest and most adaptable found anywhere in the world.

While life in these dynamic surroundings is not easy, estuarine environments are extraordinary in their richness and diversity of life. Most of the commercially and recreationally important finfish species of Virgnia spend a portion of their lives in an estuarine environment.

Estuarine communities begin with intertidal salt marshes. These low areas, characterized by muddy tidal flats, spartina grasses, and small creeks, are nature's "buffer" zones. They provide filtering areas that trap nutrients and, in recent years, pollutants, preventing them from overburdening the tidal rivers and bays. The tidal marshes are teeming with life from the everpresent snails, fiddler crabs and worms to shrimps, "fundulus" minnows, blue crabs and juvenile fish.

Unfortunately, intertidal salt marshes and wetlands have been disappearing in modern times due to the increasing pressure to

develop waterfront properties caused by the desire of more people to live near the coast. While this trend continues, the rate at which marshes and wetlands have been declining is slowing, as regulations have focused efforts on environmentally "friendly" development which provides protection for these critical and sensitive areas. Increased protection of tidal marshes and wetlands is a key component in maintaining the water quality of the Chesapeake Bay and preserving much of its marine life.

Sea grasses, mainly eelgrass, thrives in shallow waters, often growing best in waters that are somewhat protected from excessive wave and current movements. They provide protection for many small fish and molting blue crabs, making this habitat attractive for numerous game fish.

In addition, sea grass beds serve a filtering role, helping sediments to trickle to the bottom which produces better water clarity. Sea grass beds dissipate wave energy, which helps to reduce shoreline erosion and improves water clarity. Ironically, many scientists believe excessive runoffs, a form of non-point source pollution which causes increased water turbidity, was responsible for killing many sea grass beds in the Chesapeake Bay during the 1970's, probably triggered by the torrential rains and massive floods associated with Hurricane Agnes in 1972. Thus, while sea grasses are important in preserving and improving water quality, it may have been poor water quality which killed massive sea grass beds 30 years ago.

During the last fifteen years, however, the Chesapeake Bay clean-up initiatives have focused on controlling agricultural and urban runoff, and sea grass beds are starting to make comebacks. In many ways the health of sea grass beds may be a good measure of the health of the Bay, since sea grasses require good water quality, low in suspended sedimentary runoff, nutrients, pollutants and phytoplankton, to thrive.

Oyster rocks and bars are the major types of natural "reef communities" in the Chesapeake Bay. A host of small invertebrates are attracted to the oyster rocks and contribute to the food chain. In turn, these "live bottom" areas attract a host of small finfish, which are sought out by even larger game fish.

Oysters are filter feeders, straining small plankton and nutrients from the water column, which is an important component of maintaining the Chesapeake Bay's water quality. At the start of the 20th century oyster rocks rising ten feet off the bottom were not uncommon. Oysters were so numerous they were thought to be able to filter an amount of water equivalent in volume to the entire Chesapeake Bay in less than a week. Disease, pollution and overharvesting have reduced oyster populations to a fraction of that level, and today's population of oysters would take nearly a year to filter the water volume of the Chesapeake Bay. Rebuilding the oyster population is a major priority of fishery managers in Virginia.

Another concern in recent years has been a declining trend in some of the prime forage fish, especially menhaden and bay anchovies, in the Chesapeake Bay. Menhaden are the other major filter feeder associated with the Bay, thus serving a dual role as forage for many important recreation fish and a component in the Bay water quality equation. Observers are unsure whether this decline is a short term phenomenon or a longer term problem, but efforts are being mobilized to investigate this issue.

The Chesapeake Bay offers a tremendous variety of recreational fishing opportunities, but no fish is more symbolic of the Bay than the striped bass.

The Chesapeake Bay is the largest spawning and nursery area for striped bass on the East Coast. As much as 80% of the coastwide migratory population is thought to be native to the Bay.

Striped bass, like shad and herring, are anadromous; this means they spend the majority of their lives in saltwater but return to freshwater rivers to spawn. They can be caught in virtually every portion of the

Chesapeake Bay and its tributary rivers. In addition, stripers can be found at some place in the Bay every day of the year. The resurgence of striped bass populations in recent years from the population collapse in the 1970's, which nearly culminated in their listing as a threatened species, is one of the spectacular success stories of modern fisheries management.

Striped bass provide just one of several opportunities for small boat fishermen to do battle with adversaries which may weigh 50 pounds or more. In addition, the Bay offers seasonal runs of cobia, red drum and black drum. Red drum and black drum appear in Bay waters in mid-April, while cobia usually appear on the Memorial Day weekend.

The reappearance of seagrass beds in several locations in the Bay may be the reason speckled

trout populations have grown in recent years. Since the late 1980's, speckled trout populations have been increasing, and the favorite haunts of this popular game fish are shallow water flats with abundant seagrass beds.

The Chesapeake Bay is a summertime home for many species of "panfish". Summer flounder, croaker, spot, and small gray trout are the favorite targets for many anglers bouncing baits along the bottom. Spanish mackerel and small bluefish can be taken by a variety of methods using artificial lures and bait, and in recent years anglers have started to learn the methods which are productive for catching the visiting populations of spadefish and sheepshead. The reappearance of some larger gray trout is welcome news for recreational fishermen approaching the new millenium and is another example of the positive contributions of serious fisheries management.

Tautog can be found over wrecks and obstructions in the lower Chesapeake Bay all year but are most active when the water is cool. They remain active throughout the winter, as long as water temperatures remain in the low 40's, or higher. Black sea bass can be found in the same areas from late spring through the fall.

COASTAL WATERS

The coastal waters off Virginia are a part of the Mid-Atlantic Bight, which begins at Cape Hatteras, NC and extends well into New England. The waters in this area are classified as temperate, which means they enjoy a moderate temperature regimen, neither hot nor cold. This does not necessarily mean the waters are always hospitable for marine fish, however, since temperate waters are marked with a wide variance of water temperatures during the course of a year.

The surface water temperature off the Virginia coast, as measured at the Chesapeake Light Tower during the thirty year period of 1961-1990 showed an average annual temperature range of approximately 45 degrees. In the winter, the water temperature often fell to 36 degrees and often reached 81 degrees in the middle of the summer. During that 30 year period the temperature extremes recorded were 33 degrees for a low and 83 degrees for the high – a range of 50 degrees.

The impacts of such a wide temperature range on fish are profound. Temperatures at the warm and cold extremes of the range are not suitable for many species. The result is a transient population of marine fish in the coastal zone, with most species of fish migrating into and out of the area seasonally, depending upon their preference for warm or cool water. Those species which remain in waters of the Mid-Atlantic Bight year round may move to deeper waters to winter, where they often exhibit sluggish behavior characterized by reduced feeding activity.

Other forms of marine life also are impacted by the wide annual variance in water temperature. Plankton thrives in the late spring, summer and early fall, but is conspicuously absent in the winter months. The result is a breakdown in the food chain, resulting in fewer available food supplies for fish that do not migrate.

The relatively flat, featureless sand bottom that lies under the surface of most coastal waters off Virginia is not the type of environment preferred by most fish. Natural

"live bottom" areas, such as the coral reefs often found in southern waters and rock outcroppings of northern waters, are few in this region.

The natural structures in coastal waters which are attractive to fish are underwater hills and lumps, such as the Southeast Lumps, the 26 Mile Hill and the Cigar. However, the most preferred bottom structures in local waters may have been produced by man. The coastal bottom is littered with the sunken hulks of vessels torpedoed by the German Navy's U-boats during World War II, and an active artificial reef program continues to sink habitat for fish. These artificial reefs harbor fish year round, including the best fishing for tautog and sea bass on the East Coast.

The coastal zone might best be described as a giant migratory corridor, which is a function it performs for a tremendously diverse mix of finfish species. For the most part, fishermen are attempting to intercept these interlopers as they head toward their ultimate destinations.

The coastal waters from Cape Hatteras to the mouth of the Chesapeake Bay are where the Mid-Atlantic Bight joins the South Atlantic Bight, and fish indigenous to both areas mingle seasonally. The warm Gulf Stream current mixes with the cold Labrador Current over the edge of the Continental Shelf, and many species ride these waters into this "mixing bowl". This is the reason anglers in this area are provided with a myriad of fishing opportunities.

Some of the warm water species migrating to coastal waters during the summer months include amberjack, cobia, king mackerel, Spanish mackerel, crevalle jack, spadefish, and even a few tarpon and barracuda. Species which move to northern waters during the heat of the summer, but are present in the spring and the fall include striped bass, bluefish, bluefin tuna, bonita, and little tunny.

The surf zone and near shore waters host a variety of feisty, and tasty, game fish, including flounder, bluefish, speckled trout, gray trout, red drum, Spanish mackerel, striped bass, kingfish (roundheads), croaker, spot, and pompano. Many of these species are most abundant in the late spring or the early fall as they are migrating to their summer and winter haunts. A particularly good time to find large numbers of fish moving through near shore waters is after cold fronts and storms in the early fall, which sparks the urge for many species to school and begin their migrations south.

OFFSHORE WATERS

The western edge of the Gulf Stream current brings warm, tropical waters into the mid-Atlantic region. The Gulf Stream comes closest to the coast of the United States off southern Florida, but the eastward protrusion of Cape Hatteras into the Atlantic causes the Gulf Stream to pass within 25 — 30 miles of the coast at this point. The warm current then begins to veer to the northeast as it mixes with the Labrador Current. The western edge passes off the Virginia coast along the edge of the 100 Fathom Curve, which is 55 — 65 miles offshore.

These indigo blue waters are incredibly rich with life, from the blooms of small plankton and invertebrates often associated with lines of drifting Sargassum weed to magnificent blue marlin. The ocean bottom in the area of the 100 Fathom Curve provides the best natural structure in ocean waters off the Virginia coast. Here, the Continental Shelf ends and water depths plummet. Sheer rock walls, rock outcropppings and mounds abound on the bottom. In the space of a few miles, water depths tumble from 100 fathoms to over 2000 fathoms. The Norfolk and Washington Canyons are two areas where deep waters intrude well westward into the Continental Shelf.

The sharply changing terrain of the bottom causes subsurface currents to veer toward the surface, creating "upwellings" of cooler water, which push nutrients to the surface. Swirling eddies of warm water break off the Gulf Stream and often head west onto the Continental Shelf. Cool water eddies also invade shelf waters from the southern moving Labrador Current. These types of actions cause sharp

water temperature changes to occur at the surface and bring nutrients into areas attracting a myriad of marine life including game fish.

Many anglers believe the Gulfstream waters harbor the most magnificent game fish found anywhere in the world. For a combination of power, speed and "grayhounding" jumps, no fish in the ocean can match the magnificent blue marlin. Reaching sizes in excess of 1000 pounds, the blue marlin is considered the ultimate test of angling skill and sheer endurance. Its smaller cousin, the white marlin, is the most acrobatic of the billfish and can be particularly tough for anglers to hook. Both species are readily available off the Virginia coast, and in the late summer and early fall some of the best fishing for white marlin in the world occurs off Virginia.

Three additional members of the billfish family are regularly encountered off the Virginia coast, although none can be considered abundant. Sailfish and spearfish regularly surprise anglers trolling for their larger and more abundant cousins, and anglers fishing in the offshore canyons at night during the latter part of the summer have the chance to hook a swordfish.

The wahoo has the reputation as the fastest game fish in the ocean, and the dolphin, with its dazzling blue, green and yellow coloration, is among the most beautiful. Both are plentiful off the Virginia coast, particularly around floating structure such as boards, pallets and other "flotsam", and around concentrations or "lines" of Sargassum weed. Wahoo are particularly abundant in September and early October.

The tunas are well represented in Gulfstream waters, with yellowfin tuna and bigeye tuna the most abundant and most sought after by local charterboat fleets. Schools of albacore, blackfin tuna and skipjack tuna also are occasionally encountered.

The area on the fringes of the Gulf Stream, which is teeming with life, is a prime location to find the ocean's top predator — the shark. Great hammerhead sharks often can be seen swimming near the surface in the ocean canyons, but seldom attack a trolled bait. Blue sharks are most numerous in offshore waters, but the mako shark is the predator most prized by recreational fishermen. The mako is noted for its blistering speed, twisting jumps, and quality on the dinner table. The spring and early summer is the time to find mako sharks off the Virginia coast, since they prefer cooler waters and often follow schools of bluefish and tuna on their northern migrations.

EASTERN SHORE BARRIER ISLANDS

Virginia's Eastern Shore, a peninsula which begins at the border between Virginia and Maryland and extends to the mouth of the Chesapeake Bay, is flanked on the east by a stretch of uninhabited barrier islands. Between the barrier islands and the mainland is a network of shallow bays, channels, and saltwater marshlands, which are among the richest and most productive remaining on the Atlantic coast. This barrier island complex, which includes more than 70 miles of coastline, is the longest stretch of natural beach remaining on the East Coast.

The barrier islands are narrow strips of sand which are frequently overwashed by high tides and storms. The winds and surging waters associated with coastal storms are constantly reshaping the islands. New inlets form as old ones close, marshes are covered as portions of the islands move to the west, and the shape of the beach changes as new points, sloughs and sandbars are formed. The dynamic nature of these islands is the primary reason permanent settlement by man is impractical, and why these islands remain in a natural state.

The islands provide the mainland with protection from the devastating impacts of coastal storms, particularly northeasters and hurricanes. The primary energy of the tides and waves is absorbed by the islands, buffering the mainland from the severest forces of erosion.

The islands are a nesting sanctuary for at least 23 species of colonial nesting birds, including the extremely rare piping plover. They also provide resting and feeding areas for many other species of migratory shorebirds, songbirds, raptors, and waterfowl.

The marshlands behind the barrier islands function in the same manner as the marshes of the Chesapeake Bay. They provide a "buffer" zone for run-offs coming

from the mainland. Sediments, nutrients and pollutants are trapped in the marshes, and organic material is slowly released into the water. This provides an indispensable source of nutrients to this estuarine system, while maintaining water quality by preventing too many nutrients, sediments or pollutants from entering the system at one time.

The nutrients provide a source of food for a variety of marine life, including juvenile fish and shellfish and make this area a major nursery ground for several species of fish. The richness of the waters also attracts a variety of game fish.

However, even the seaside bays and marshes, in their relatively undisturbed condition with some of the best water quality remaining on the Atlantic coast, have not escaped the infirmities which have affected most coastal areas. Run-off from the mainland occasionally enters the seaside marshes in quantities that overburden the system with sediment and contaminants. Submerged sea grass beds, which were abundant in many seaside waters at the start of the twentieth century, disappeared in the 1930's and have shown no sign of returning. Oysters and oyster rocks provided natural "reef communities" in many places along the seaside in years past, but only a fraction of the oyster population remains today.

Even so, seaside waters offer a variety of fishing opportunities. The summer flounder is the undisputed king for recreational fishermen. They are abundant from April through September in virtually every inlet, bay and channel behind the barrier islands.

Seaside waters also harbor good populations of gray trout (weakfish), black drum, red drum, bluefish, croaker, spot, kingfish (roundheads), and Spanish mackerel. The only viable recreational fishery for tarpon in Virginia occurs in the "back country" marshes of the southern portion of the seaside.

The relatively protected waters behind the barrier islands make this an ideal place for anglers with small boats to fish. Access is easy with most seaside communities providing excellent launching facilities.

Surf fishing can be superb on the barrier island beaches, highlighted by the fall fishery for big red drum. Bluefish, striped bass, gray trout, flounder, kingfish, croaker, and spot roam the beaches seasonally.

Assateague Island, the northernmost barrier island, is a part of the National Seashore system operated by the National Park Service. A causeway provides access for surf fishermen, who can park at numerous areas along a road that runs behind the oceanfront dunes. Four-wheel-drive vehicles are allowed to drive on designated portions of the beach at certain times of the year. Information about usage of the beach may be obtained from Assateague Island National Seashore, P.O. Box 38, Chincoteague, VA 23336, (757) 336-6577.

Most of the remainder of the barrier islands and some of the marshland are owned by the Nature Conservancy, which insures these areas will be protected in their natural state. The only access available to these islands is by boat from the mainland, then a walk down the beach to a favorable spot for surf fishing.

The Virginia Coast Reserve, the program of the Nature Conservancy that administers the barrier islands preserve, has specific policies regarding the public use of these lands. Most of the barrier islands are open to the public for day use, including such activities as surf fishing, hiking, swimming, birdwatching, picnicing, and photography. Ship Shoal, Little Cobb, and Revel's Islands are not open for public use. Visitors are requested not to disturb nesting birds and bird colonies, research sites and the natural qualities of the islands. Certain activities are not permitted, such as fires, overnight camping, pets, and motorized vehicles. Information about the Virginia Coast Reserve, including membership options for this conservation group and policies on usage of the barrier islands, can be obtained from the Virginia Coast Reserve, Brownsville, Nassawadox, VA 23413, (757) 442-3049.